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FILE

MEMORANDUM FOR PRS (In-House Publication)

06 Nov 2002

FROM: PROI (STINFO)

SUBJECT: Authorization for Release of Technical Information, Control Number: **AFRL-PR-ED-AB-2002-265**
Greg Drake (PRSP), "TTCP Ingredients for Energetic Materials: Air Force Research Laboratory, Edwards AFB, CA" (abstract only)

Greg
5-5355

Int'l Report to be used by Dr. May Chan (NAWC), USA Focus Officer of TTCP WTP-4 Focus Area "Ingredients for Energetic Materials" **(Statement A)**
(No location or date provided) **(Deadline: 04 Nov 02)**

TTCP Report for May Chan AFRL/PRSP Energetic Ingredients work for Fiscal Year 2002.
Reporting officer: Dr. Greg Drake AFRL/PRSP

Energetic ingredients work being carried out at the Air Force Research Laboratory has made significant strides in the last year. In the area of monopropellant ingredients, synthetic endeavors with oxyamines based materials have continued. Propylene bisoxyamine, $(NH_2\text{-}O\text{-}CH_2\text{-}\ CH_2\text{-}CH_2\text{-}O\text{-}NH_2)$, was investigated as a precursor of a large family of energetic salts. Both the monoprotonated as well as the diprotonated salts using nitrate, perchlorate, dinitramide, as well as nitroformate anions were synthesized in high yields and purities. This entire family of salts has friction and impact sensitivity issues, and subsequent studies are being continued in order to complete a full manuscript, on both this family as well as the previously reported ethylene bisoxyamine materials.

Nitrocyanamide salts were fully investigated, including the determination of the crystal structures of the monomethylhydrazinium nitrocyanamide, methoxyammonium nitrocyanamide, and the diaminoguanidinium nitrocyanamide. Most of the salts were either impact/friction sensitive or had thermal stability problems. This work is currently being written up into a full manuscript for publication.

A new class of energetic ionic liquids based on 1-alkyl-4-amino-1,2,4-triazolium cations have been synthesized. They have been subsequently paired with energetic anions including the nitrate, perchlorate, dinitramide, and nitrocyanamide. A majority of these materials were recovered in high yield and purity, with melting points below room temperature and high decomposition onsets. The salts had excellent thermal stability at elevated temperatures as well as good to excellent safety properties. This area of work has become one of the focal points of the HEDM research group at Edwards.